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The Legacy of Jacob Bronowski

An Exhibition of Books and Papers Selected from the Jacob Bronowski Collection

October, 1977

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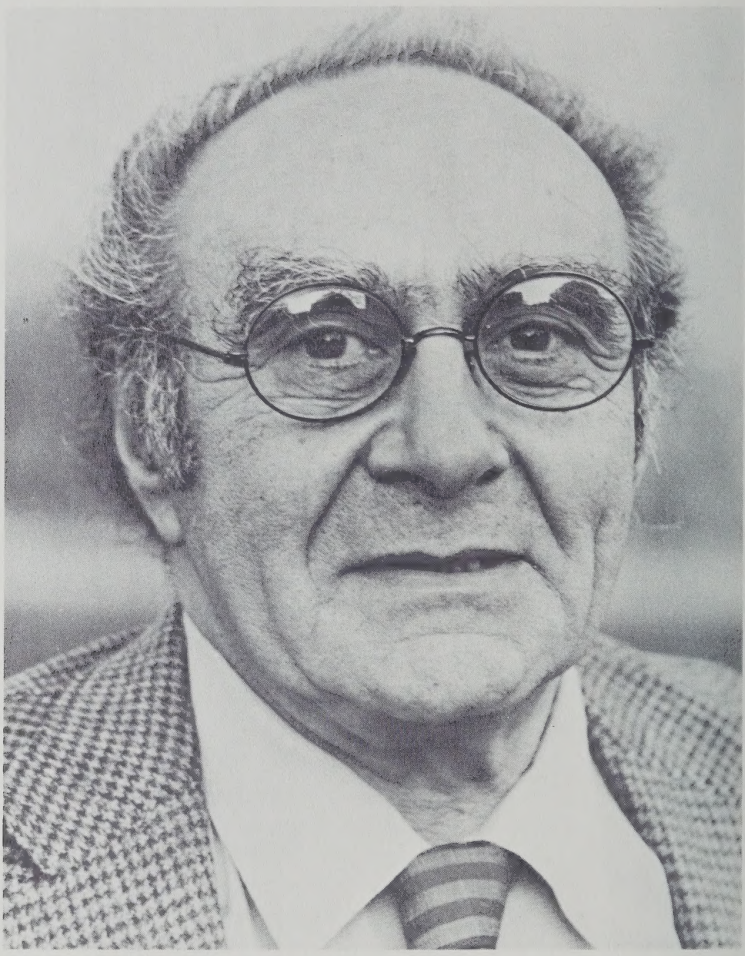

JACOB BRONOWSKI

The Legacy of Jacob Bronowski

WITH THE DEATH of Jacob Bronowski in 1974, contemporary society lost one of its most humane and rational voices. As poet, mathematician, playwright, philosopher and historian of science, literary critic and scientist, Bronowski laboured to create a philosophy for the twentieth century and to eradicate the destructive prejudices of the age. He showed the humanity of science to a generation horrified by the atomic bomb and fought for the harmony of science and the arts in the age of the 'Two Cultures'. In the face of increasing specialization in every field, he steadfastly remained a generalist. He summed up his own work in the following way: 'All that I have written, though it has seemed to me so different from year to year, turns to the same centre: the uniqueness of man that grows out of his struggle (and his gift) to understand both nature and himself.'

Bronowski's own struggle, pursued with conviction and insight, brought forth a substantial body of books, essays, lectures and films. A complete collection of these, together with Bronowski's professional papers, was generously given to the University of Toronto Library in 1977, by his wife, Mrs. Rita Bronowski. The resulting Bronowski Collection, housed in the Thomas Fisher Rare Book Library, forms an indispensable resource for an exploration of the work and influence of Jacob Bronowski. His manuscripts and correspondence provide not only much of the foundation for a biography, but also throw light on the origins and growth of his ideas. His relationships with the scientific, academic and literary communities are illuminated and his impact on the large public who were his readers and viewers is made strikingly evident. The published writings, from monographs and journal articles to the most ephemeral magazine pieces, are gathered,

and corrected in the author's hand. A further collection of books containing references to or quotations from Bronowski's writings attests to the widespread diffusion of his ideas in both scholarly and popular writing.

The exhibition of the works of Jacob Bronowski, held at the Thomas Fisher Rare Book Library in October and November, 1977, draws on the printed works and manuscripts in the Bronowski Collection. It is designed to publicize the acquisition of the collection and in so doing, to commemorate the achievement of a unique man. This pamphlet, issued to accompany the exhibition, will survey the life and works of Jacob Bronowski and may perhaps serve as a small contribution to the preservation of his legacy.

Early Life (Case 1)

JACOB BRONOWSKI was born in Poland in 1908; his family moved to Germany in 1912 and to England in 1920. So Bronowski, who had already changed his language once at the age of three, was compelled to change a second time at the age of twelve. He recalls, with some relish and not a little irony, considering that he was later to become a vigorous and persuasive practitioner of the English language, that he arrived in England knowing only the words 'Good afternoon'. The family settled in London's East End and Bronowski was immersed at once in the educational system of the London Council schools. Taken by a friend to the Whitechapel Public Library, he asked the librarian what he should read in order to enrich his schoolboy's grasp of the language and to the librarian's choice – *Midshipman Easy* by Captain Marryat – Bronowski attributed his literary style.

Learning a new language at the age of twelve had special significance for Brownowski, for he learned to speak English at the same time that he learned the first steps in science. The distinction between literature and science, the harmful and illusory nature of which was to be a recurring theme in his later work, was never a reality for Bronowski for literature and science 'were simply two languages for experience that I learned together'.

Bronowski arrived at Cambridge in 1927; his years there coincided with a period of great excitement in physics. Fundamental dis-

coveries were being made in quantum physics and atomic structure by such men as Chadwick, Dirac and Cockcroft; Einstein, about whom Bronowski was later to make a film for the Canadian Broadcasting Corporation, produced by Lister Sinclair, came to lecture. Bronowski, as a student of mathematics, was fully involved in the excitement of these events but, characteristically, devoted much of his energy to literature and especially to poetry. Together with Humphrey Jennings, William Empson and others, he founded and edited a literary magazine entitled *Experiment*. The title is indicative of the approach taken by the editors to the practice of literature. Bronowski was a regular contributor to this magazine as well as to the Cambridge journal *Granta* and the *Cambridge Review*. He also edited, together with J.M. Reeves, *Songs for Sixpence*, a series of single poems by young Cambridge poets including T.H. White, Michael Redgrave and Bronowski himself. But Bronowski's main work at Cambridge, both as an undergraduate and doctoral student, was mathematics. This work he continued at the University of Hull where he was Senior Lecturer from 1934 to 1942. He produced a considerable number of mathematical papers in such fields as algebraic geometry, topology and statistics. Bronowski's work in mathematics led to a period of research with the British Government, applying statistical methods to the economics of industry. Although Bronowski ceased to be a pure mathematician, he always brought mathematical techniques to bear where they seemed appropriate in his later research.

While at Hull, Bronowski's interest in English literature continued to grow. He explored the nature of poetry in the *Poet's Defence*. The notes for a series of lectures on the English novel delivered at Hull reveal that Bronowski had been a voracious and critical reader since his introduction to *Midshipman Easy*.

The War and *Science and Human Values* (Case 2)

DURING WORLD WAR TWO, Bronowski worked for the British Government, chiefly as the head of a number of units applying statistical methods to the study of the industrial and economic effects of bombing. In 1945, he was sent to Japan as the Scientific Deputy to the British Chiefs of Staff Mission; this resulted in the writing of the British report on *The Effects of the Atomic Bombs at Hiroshima and Nagasaki*. The trip to Japan and the entrance into the ravaged city of

Nagasaki were crucial in the development of Bronowski's attitude towards the practice of science. For although the years of war research, with their attendant secrecy and destruction, had produced in him an increasing revulsion, it was the entrance into Nagasaki that illuminated the whole experience. The moment, a 'universal moment' as Bronowski calls it, is described in the opening of his work *Science and Human Values;* it was, in fact, the inspiration for that work. In his letters to Rita Bronowski from Nagasaki, he conveys some of the horror of that scene: the desolate landscape, the broken and meaningless shapes and the ashes. Indeed, in the dusk, he did not at first realize that he had left the open country and entered the city. 'On an evening like that evening, some time in 1945, each of us in his own way learned that his imagination had been dwarfed. We looked up and saw the power of which we had been proud loom over us like the ruins of Nagasaki.'

There followed for Bronowski a long period of reflection on the nature of science and its relation to the values by which people live. In 1953, while Carnegie Visiting Professor at the Massachusetts Institute of Technology, Bronowski delivered the lectures which established him as a leader in the movement known as scientific humanism. The lectures were published in book form in the United States in 1958 and in Great Britain in 1961 under the title *Science and Human Values.*

The existence of the atomic bomb had not only a moral, but also a practical effect on Bronowski's career. On the occasion of the testing of the atomic bomb at Bikini by the Americans in 1946, Bronowski was invited by the British Broadcasting Corporation to give a short account of his experiences in Japan. As Bronowski relates: 'And I had just one of those fantastic pieces of good fortune which nobody ever has: something like fifteen million radio listeners were all glued to their radio sets trying to hear what was going on in Bikini. Nothing was going on except a lot of atmospherics. The only thing that was going on was me in the studio in Broadcasting House saying solemnly in a small voice with a Polish accent what had happened at Hiroshima and Nagasaki. And overnight I became a famous broadcaster.'

And so it was that Bronowski became a well-known and popular radio and television figure in Great Britain during the 1950's and developed the expertise and the belief in the potential of television that led him to undertake the *Ascent of Man* series in 1969. As part of the Bronowski/Bullock/Ayer triumvirate, he was a mainstay of the

B.B.C.'s *Brains Trust*. He did many television programmes explaining the basic concepts of science to the layman.

From 1950 to 1963, Bronowski was with the National Coal Board of Great Britain, first as Director of Research and then Director General of Process Development; he played a leading role in the development of smokeless fuels, dubbed 'Bronowski's Briquettes' by the press. During this period, the 'Two Cultures' debate raged, with C.P. Snow and F.R. Leavis being the chief protagonists, but it was Bronowski's *Science and Human Values* which had initiated the discussion in 1953. In his lectures and papers written during these years, such as *Architecture as a science and Architecture as an Art* and *The Educated Man in 1984*, Bronowski developed the themes that he had so clearly and passionately stated in *Science and Human Values:* that both science and art have a common origin in man's imagination and that the practice of science obliges scientists to adhere to a set of fundamental values including truth, honesty and dignity.

Drama and Poetry (Case 3)

BRONOWSKI'S CONVICTION that both science and the arts have a place in the makeup of the educated man and that both are essential although different ways of ordering our experience to create knowledge, was transmitted not only in his books and essays, but also by the example of his poetry and drama. The literary creation is as able to express truths about the world as the scientific theorem. Bronowski's play *The Face of Violence* is a case in point. It began as a scholarly essay, intended to be an analysis of the motives and manifestations of violence in modern society but Bronowski realized that the nature of the theme demanded a different mode of presentation: 'Then, early in 1950, I saw that this was not the way to present the theme in speech, and that instead the portrait, though informed by history, must be shown more directly and passionately.' And so the play was written. It was broadcast by the B.B.C.'s Third Programme in 1950, with music by Antony Hopkins and produced by Douglas Cleverdon. It was entered by the B.B.C.in the competition for the Italia Prize which is offered every two years for the best play broadcast throughout Europe and won first prize for 1950-51. It was later adapted for the stage and presented by the Old Globe Theatre in California (where Bronowski was later to settle).

The Face of Violence was certainly Bronowski's most successful and powerful play but it was far from being his only one. His dialogue *The Abacus and the Rose; A New Dialogue on Two World Systems,* broadcast by the B.B.C. and the Canadian Broadcasting Corporation, was a clever re-working of Galileo's *Dialogue concerning the Two Chief World Systems,* moving the confrontation from the sphere of the Copernican-Ptolemaic clash to the contemporary debate on the 'Two Cultures'. As delegates to a cultural conference, Dr. Amos Harping 'who represents the literary furies, something between *Scrutiny* and Jimmy Porter' and Professor Lionel Potts, F.R.S., 'who represents science: a little smug because success came young, and slow to see that there really are other points of view (and interests) than that of a molecular biologist' argue from their respective intellectual traditions, moderated by the 'urbane and maddeningly tolerant' Sir Edward St. Ablish. The dialogue conveys in dramatic form much of the content of *Science and Human Values* and was fittingly appended to a later edition of that book.

My Brother Died, first performed on the B.B.C. in 1952, was a musical play with music by Peter Racine Fricker and words by Bronowski. *The Closing Years* and *The Mission to Japan* were both radio plays growing out of his wartime experiences.

Poetry was of great importance in the life of Bronowski. His first published book was, after all, about the nature of poetry and he came to be recognized as an authority on Blake. But in addition to this, Bronowski was himself an accomplished poet. He wrote numerous poems at Cambridge, contributing to *Granta* and *Experiment.* His *Spain 1939: Four Poems,* a group of anti-war poems, was published by the Andrew Marvell Press in 1939. His *Man, Take Your Gun* has appeared in many anthologies and remains a powerful statement of the inhumanity of war. Beginning in 1939, he collaborated with his wife Rita in the creation of Christmas greetings for his friends with poetry by Bronowski and block prints by Rita.

Bronowski repeatedly drew attention to the imaginative component in both poetry and science, often with some audacity. He maintained, for example, that the invention of a scientific hypothesis is as imaginative an act as the invention of the theme and personnel of Keats' *Ode on a Grecian Urn*. That this argument has obtained a degree of acceptance is due, in large measure, to Bronowski's persuasiveness.

The unity of science and the arts is nicely expressed in his poem:

I, having built a house, reject
The feud of eye and intellect,
And find in my experience proof
One pleasure runs from root to roof,
One thrust along a streamline arches
The sudden star, the budding larches.

The force that makes the winter grow
Its feathered hexagons of snow,
And drives the bee to match at home
Their calculated honeycomb,
Is abacus and rose combined.
An icy sweetness fills my mind,

A sense that under thing and wing
Lies, taut yet living, coiled, the spring.

Blake and Leonardo (Case 4)

BRONOWSKI AT CAMBRIDGE, immersing himself in both the literary and scientific life, noticed, among a complex of similarities, a significant difference between the two traditions. In the practice of science 'To be a critic was not and is not a scientific profession'; in the study of literature, on the other hand, there was a respectable place for the critic as critic. And so, coming to the end of a long piece of mathematical research, Bronowski turned a critical eye on the nature of poetry. The *Poet's Defence* was begun in 1934 and published in 1937; in this, his first published book, Bronowski tried to 'lay bare the poet's inner view of his own activity'.

Bronowski relates that although the book was widely discussed (a scrapbook of reviews with the Collection attests to this) its readers were unmoved by the argument. Accordingly, Bronowski looked for an empirical, and hence, more concrete and persuasive test of his ideas. In order to show the relationship of poetry to social change he planned a follow-up work which would analyze the effect of the Industrial Revolution in Great Britain on poetry, examining the poetry of Pope, written before the upheaval, and that of Blake, written afterwards.

From this study came *Two Poets and a Revolution,* a work never published owing to the restraints of war-time printing. Bronowski was urged by his publisher, however, to continue with what was seen as the most important part of that work – his interpretation of the vision of Blake. 'For', as Bronowski wrote in the revised preface for that work, 'I had found in him what had not been seen before, not an eccentric mystic, but an idealist with a sense of reality much broader than I had allowed for.' Bronowski's *William Blake: A Man without a Mask* (published in America under the title *William Blake and the Age of Revolution)* was a critical success and gave a new direction to Blake studies.

Bronowski had unbounded admiration for Leonardo da Vinci. To Bronowski, Leonardo was not only a painter and sculptor, but also a pioneer who transformed the science of his day. Leonardo brought his artist's eye to nature, observing the structure and the mechanisms, seeing the processes which the structure revealed and testing the observed detail against the received theory. He saw in Leonardo a man who explored the world as both an artist and a scientist; of Leonardo's painting 'The Lady With a Stoat', Bronowski observes that it is as much 'a research into animal and man, and a creation of unity, as is Darwin's *On the Origin of Species.*'

In addition to his writings about Blake and Leonardo, Bronowski also made two colour films for the B.B.C.: 'Tell me if anything ever was done', about Leonardo and 'As a man is, so he sees', about Blake.

The Salk Institute and Human Specificity (Case 5)

IN HIS AUTOBIOGRAPHICAL BOOK *A Few Select Exits,* Gwyn Thomas describes Bronowski, his broadcasting colleague at the B.B.C., as the 'classic twentieth century European' and observes that as such, it was only natural that 'at a certain point of ripeness he should go to America.' The move to America was one made by a great number of scientists in the 1960's; they were attracted by the promise of ample facilities and the opportunity to work with an international gathering of specialists. The Salk Institute for Biological Studies, designed by architect Louis I. Kahn and built on twenty-seven acres of prime land overlooking the Pacific Ocean, donated by the citizens of San Diego, was especially attractive. The Institute, largely funded by the National Foundation-March of Dimes, was seen by Jonas Salk as a place where

biological research could be carried out by a group of first-rate scientists, without the burden of teaching responsibilities. But, in addition to this, it was to pursue biological studies with a sensitivity to the conscience of man and to the social implications of biological advances. Bronowski, after thirteen years with Great Britain's National Coal Board, was invited to join the Institute by Jonas Salk and Basil O'Connor of the National Foundation-March of Dimes. He readily accepted the invitation; it would permit him to do the kind of research he was now interested in doing. In 1963, Bronowski moved to America to oversee the human affairs programmes of the Salk Institute.

For Bronowski, the shift toward the biological sciences was abrupt but it was part of a general shift led by Leo Szilard, the eminent physicist who played a crucial role in the development of the atomic bomb, and others from the physical sciences to the life sciences. The reasons for this shift were, in Bronowski's view, part moral, stemming from revulsion with war work, and part practical, presenting the opportunity of changing one's career in mid-life. Following Watson's and Crick's work on the description of the DNA molecule, biology was seen to be as revolutionary as physics had been earlier in the century.

Bronowski's work at the Salk Institute was centred on the problem of 'human specificity'. This was a new topic in biology – in fact, one largely of Bronowski's own creating. He defined it as 'an attempt to characterize the human species by those biological and behavioural expressions which are unique, or almost unique to human beings'. Much of his research was done on the nature of language. In *Human and Animal Language* he considered the possibility of seeing an evolutionary sequence in the development of human language. In *Language, Name and Concept,* Bronowski undertook, together with his colleague at the Salk Institute, Ursula Bellugi-Klima, a study of the 'language' of the Chimpanzee, Washoe, and concluded that the first steps had been taken towards the separation of a primate's capacity for language and the capacity for making the sounds of human speech. In *Language in a Biological Frame,* he examined the extent to which human language might be a biologically mediated development of more rudimentary capacities in other species.

Bronowski's opportunity to do the kind of research he wanted was further enlarged with the establishment of the Council for Biology

in Human Affairs in 1970. Bronowski was appointed Director of this Council, a post which he held until his death in 1974. The primary objective of the council was to bring together people from varied academic backgrounds and public leaders to carry on research into the social and humanistic consequences of biological advances. To meet this objective, Bronowski directed a number of programmes such as the symposium on 'The Entry of Biology into Human Affairs'.

Warren Weaver, one-time Director of Science for the Rockefeller Foundation, remarked of Bronowski that 'there was no aspect of the most detailed and technical work of that Institute which he could not understand, illuminate, interpret and enrich'. The papers in the Collection relating to the Salk Institute and to the Council For Biology in Human Affairs document Bronowski's contribution, showing him organizing symposia, advising on the selection of personnel, participating in the administration as a Fellow and Trustee and delivering papers on his research interests.

The Nature of Human Knowledge (Case 6)

IN AN INTERVIEW with George Derfer, Bronowski observed that he had been 'closing in more and more in the last ten years on the constituents of the human being that give the capacity to create knowledge.' This study, as an aspect of the topic of 'human specificity', was of great importance to Bronowski, for an understanding of how humans acquire and structure their knowledge of the world was a necessary preliminary to the formulation of a Natural Philosophy. In the work done at the Salk Institute and in many lectures given throughout the United States from 1964 to 1974, Bronowski refined and enriched his ideas on the subject.

In the Silliman Memorial Lectures, entitled 'The Origins of Knowledge and Imagination', delivered at Yale in 1967, Bronowski explored the mechanisms by which human beings receive and order their experiences of the world. In the Mellon Lectures on 'Art as a Mode of Knowledge', delivered at the National Gallery, Washington, D.C. in 1969, he developed a theme that had always been prominent in his work: that a work of art is, in an important sense, a carrier of knowledge, particularly with respect to human experience and values. In *The Identity of Man,* an expansion of the Man and Nature Lectures

given at the American Museum of Natural History in New York, 1965, Bronowski concluded that the special character of human knowledge made man more than a machine, that 'Man is a machine by birth but a self by experience.' In the Frank Gerstein Lectures, delivered at York University in 1963, on *Imagination and the University,* Bronowski considered the role of imagination in poetry and in mathematics.

'The Ascent of Man' (Cases 7 and 8)

THE CONCEPTION of a major series on the history of science was first presented to Bronowski in June of 1969. The first outlines were sketched that summer and by December, 1972, the filming was completed. The Salk Institute graciously gave Bronowski sabbatical leave to allow him to work full-time on the series. But, far from being an interruption of his work at the Salk Institute, *The Ascent of Man* was more in the nature of a culmination; Bronowski now had the opportunity to engage himself in a major way in considering the question that had been occupying him for years: What makes man unique?

The question had dramatically presented itself to Bronowski in the form of a specific event in 1950. A debate was then raging between classical anthropologists and those who were using statistical methods. Bronowski was brought into this debate by his friend, the Oxford anatomist Wilfred Le Gros Clark, who asked him if he could apply statistical techniques to determine whether the teeth of a skull, found by anthropologist Raymond Dart, were more man-like or ape-like. Bronowski's solution was instrumental in convincing others of the humanity of the skull, but more importantly for Bronowski, it gave a turn to the direction of his own interests. As he relates in *The Ascent of Man:* 'It transmitted to me a sense of excitement which I remember at this instant. I, at over forty, having spent a lifetime in doing abstract mathematics about the shapes of things, suddenly saw my knowledge reach back two million years and shine a searchlight into the history of man. That was phenomenal.'

The series was viewed as a complement to Sir Kenneth Clark's *Civilization,* which would do for science what that programme had done for art; but under Bronowski's guidance, it became more than just a history of science. Although the series was to be chiefly about

man's great scientific achievements, science was to be seen in its cultural context, as something that 'emerges as a natural activity in each age at a level appropriate to that age'. In approach and intent, the *Insight* series, which Bronowski had done for the B.B.C. in 1961, was the forerunner of the *The Ascent of Man.* In the earlier series, Bronowski had explained the concepts of science to his audience with vigour and clarity. But he had gone further; he had tried to show that in understanding nature we were not merely observing the workings of some clockwork mechanism, rather we were contributing something of ourselves in the act of understanding. The *Insight* programmes were personal; they tried to create, as Bronowski said 'one scientist's vision of the world – one man's vision'.

So too in *The Ascent of Man,* Bronowski's ambition was as great in scope as the series was in its execution; 'My ambition here has been the same as in my other books, whether in literature or in science, to create a philosophy for the twentieth century which shall be of one piece ... Like them this series presents a philosophy rather than a history and a philosophy of nature rather than science. Its subject is a contemporary version of what used to be called Natural Philosophy.'

In a series of thirteen one hour television programmes, each dealing with a separate concept, but all related, Bronowski presented his mature and final Natural Philosophy. The publication of the book under the same title allowed Bronowski to fill in some gaps and provide some connecting material, but the films remain the more spectacular achievement. Bronowski was well experienced in exploiting the medium of television. Not only had he acquired the ability to present ideas, some of considerable abstraction and complexity, clearly and enthusiastically, he had also come to respect the power and immediacy of television and to utilize its unique capacity to take people inside the processes and places described, to make them aware that what they were seeing were not mere events but, rather, the actions of people. In its production, *The Ascent of Man* series easily surpassed the superlatives that were applied to it. Camera crews visited twenty-six countries from Easter Island to Ethiopia and utilized the full range of special photographic techniques to illuminate scientific processes.

The Collection contains all the material relating to the production of the films and the publication of the book from early research material and the first formulations of the themes to the final print and book.

Correspondence from the public reveals that Bronowski's vision was enthusiastically received.

The humanity and the reasonableness of Bronowski's vision are everywhere evident in his writings and films. His contribution to the intellectual history of the twentieth century awaits a final assessment. It is hoped that the preservation of the Jacob Bronowski Collection at the Thomas Fisher Rare Book Library will assist in this.

Ian Crellin
Thomas Fisher Rare Book Library

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